

Lake St. Croix inflow monitoring at Stillwater, MN

Purpose and Scope

An index-velocity gaging station was installed at Stillwater in September 2011 to provide direct estimates of discharge and nutrient loading to Lake St. Croix through 2013. We are requesting funds to continue index-velocity gaging at Stillwater for three additional years (2014-2016). Continuation of the index-velocity gage would provide more accurate discharge data for calculating phosphorus loads to Lake St. Croix than the current alternative of using dam releases at St. Croix Falls. Continuous direct estimates of mainstem discharge from the index-velocity gage are critical to current and future lake water quality modeling and management.

Progress to Date

Summary March 18, 2014

Not much to report - we don't have a signed agreement yet. Buzz has both detailed proposals as of last week. Jeff Ziegeweid will coordinate with him next week to make sure the funding moves through WI DNR.

Status is as follows:

The Stillwater gage is installed and collecting data, and communication upgrades are planned once ice is off the river. Plans are being made to deploy the water quality sondes in pools three and four in late May, after the spring runoff season. Sondes will be in the river through October 2014, collecting observations every 15 minutes.

Summary June 10, 2014

The Stillwater gauge velocity meter has been moved to its new location and data are being collected to develop a new velocity-to-discharge relationship. Communication upgrades are scheduled to occur in late June.

Streamflow and nutrient load calculations for major Wisconsin tributaries to Lake St. Croix

Purpose and Scope

The proposed work includes collecting samples for nutrients (total Phosphorus (P), dissolved P, Nitrate+Nitrite, Ammonia, Kjeldahl Nitrogen) and suspended solids during both base flow and storm-event conditions in order to compute daily nutrient and suspended solids loads when combined with continuous discharge data from the Willow and Kinnickinnic Rivers and daily flow estimates for the Apple River provided by the dam operator (checked by USGS staff). The requested funding would cover two (2) years of sampling and load computation, followed by one (1) year of funding to perform statistical analyses of the data and describe the results in a report.

Progress to Date

Summary March 18, 2014

We are just now getting the funding agreements in place, so at this point no project funds have been spent. Having said that, we are proceeding with the St Croix Tribs loading project as planned. Building upon phosphorus-only loading work we started in 2012 that was funded by USGS and the Wisconsin DNR, this year we have expanded our water sampling to include suspended sediment and nitrogen loading. This work continues at the Kinnickinnic River, Willow River, and Apple River where we have continuous record stream gages at the first two, while discharge is provided by Xcel Energy at Apple River. Baseflow water samples are collected one per month year-round at each site, and high water/storm samples will be collected this spring/summer/fall at all rivers. With the substantial snowpack we currently have in the Upper and Lower St Croix River Basin, we could have considerable high flow from runoff this spring. Next week I will begin the process of calculating phosphorus loads for the three rivers for the 2013 water year (Oct 1, 2012 - Sept 30, 2013). That process should be completed and through the USGS data review process in March, and the loads will be available after that. That should be everything at this point in time, and obviously as the spring approaches things will be getting busier!

Summary June 10, 2014

Here is some update material for the GMAT meeting.

1. Funding agreements for the 2014 fiscal year mitigation funds through WDNR are in place.
2. Results for total phosphorous loading in the 2013 water year are as follows: Kinnickinnic River had 30,400 lbs, Willow River had 37,600 lbs, and Apple River had 32,700 lbs. At Kinnickinnic, two spring snow melt events and two June rain events resulted in 62% of the

total phosphorous export from the basin. Willow River had 76% of its total phosphorous export in April and May, the result of spring snow melt and rain. At Apple River, spring runoff resulted in 50% of the total phosphorous exported, while 25% of the total was from a late June rain event. This data is available using the USGS NWIS mapper (<http://maps.waterdata.usgs.gov/mapper/index.html>). The gage numbers are 05342000 for Kinnickinnic River, 05341500 for Apple River, and 05341752 for Willow River.

3. In the 2014 water year, baseflow and high flow event samples continue to be collected at all sites. Discharge was very high this spring as a result of snow melt, and we continued to have consistent events through April and May due to rainfall. As of May 29, we have collected 74 event samples from the three rivers.

Support for Basin Team Coordinator position

Purpose and Scope

A primary goal identified in the St. Croix Basin Water Resources Planning Team's 2011 strategic plan was to support Basin Team activities to ensure effective operation of the Team and communication of its mission and goals including the goal to protect water quality of the St. Croix River and Lake St. Croix. The Team stressed the importance of continued funding for the Team's Coordinator Position which would provide interagency communication about relevant meetings, activities including modeling and monitoring, action items, and initiatives including Lake St. Croix TMDL Implementation, and to respond to public notices concerning projects or permits with the potential to degrade the water quality of Lake St. Croix including expected development in Western Wisconsin related to the new crossing.

Progress to Date

Summary March 18, 2014

September - November 2013: developed the agenda, secured a guest speaker, organized the annual river inspection tour, set up the meeting space and attended the Basin Team's quarterly meeting September 12; coordinated communication with Basin Team members through emails and phone calls; tracked the agenda and minutes of the Highway 64 Corridor Community Task Force (Stillwater Bridge Mitigation Projects); attended the Conference Planning meetings on September 17 and November 5, the Implementation Team meeting October 30, and the annual Research Rendezvous October 15; participated in conference calls; did background research on the Namekagon stream gage and Wood River sediment issue; reviewed the NPDES public notices for both states; and wrote a letter of appreciation on behalf of the Basin Team for a retiring USGS Staff member.

December 2013: set up the meeting space and attended the quarterly meeting of the Basin Team December 12 and transcribed the minutes of the meeting; coordinated communications with Basin Team members through emails and phone calls; tracked the work of the Highway 64 Corridor Community Task Force; attended the Implementation Team meeting December 18; and reviewed the NPDES public notices for both states.

January 2014: attended the Basin Team's Emerging Threats Subcommittee meeting 1/23/14, the Implementation Subcommittee meeting 1/29, the Monitoring Subcommittee meeting 1/30, and the Highway 64 Communities Stormwater and Wastewater Collaborative meeting 1/9; wrote a letter of support for an Aquatic Invasive Species grant proposal; transcribed the minutes of the 12/18/13 Implementation meeting; reviewed the annual conference brochure for editorial changes; reviewed the NPDES public notices for both states; reviewed the Ogilvie, MN wastewater treatment plant permit; and coordinated communications with Basin Team members through emails and phone calls.

February 2014: attended the Basin Team's Implementation Subcommittee meeting 2/26 and the Highway 64 Communities Stormwater and Wastewater Collaborative meeting 2/13; transcribed the minutes of the 1/29 Implementation meeting; attended the St. Croix Forestry and Water Quality Conference 2/27 and moderated a session; reviewed the NPDES public notices for both states; and coordinated communications with Basin Team members through emails and phone calls.

Status of Agreement: The WDNR and the Science Museum of Minnesota have a signed agreement covering the Coordinator's funding. The Science Museum serves as the fiscal agent and reimburses the Coordinator on a monthly basis. The WDNR has not yet reimbursed the Science Museum for the annual cost of the program, as of 3/7/14.

Summary June 10, 2014

March 2014: Services included securing a guest speaker, drafting, revising, and distributing the agenda for the 3/27/14 quarterly meeting and attending the meeting, drafting and distributing minutes for the Basin Team's Implementation Subcommittee meeting of 2/26, reviewing the agendas and minutes of the Highway 64 Communities Stormwater and Wastewater Collaborative meetings, transcribing the minutes of the 3/27 quarterly meeting, reviewing the NPDES public notices for both states, reviewing the MPCA report on the Snake River watershed, providing input on water quality and flow conditions for the St. Croix NSR for the NPS Wild and Scenic Rivers Workshop, adding new members to the Basin Team email list, and communications with Basin Team members through emails and phone calls.

April 2014: Services included revising and distributing the minutes for the 3/27/14 quarterly meeting, attending the annual St. Croix Protection Conference 4/8, reviewing the agendas and minutes of the Highway 64 Communities Stormwater and Wastewater Collaborative meetings, attending the St. Croix Conservation Collaborative meeting 4/16, attending the Basin Team's Implementation Subcommittee meeting of 4/30 and taking minutes, drafting, revising, and mailing a letter of support for the National Heritage Area designation for the St. Croix Watershed, reviewing the NPDES public notices for both states, adding new members to the Basin Team email list, providing the last year's minutes to one new member, and other communications with Basin Team members through emails and phone calls.

May 2014: Services included transcribing/distributing minutes of the 4/30 Implementation Subcommittee meeting, attending the St. Croix River Crossing Environmental Protection Forum 5/14, the St. Croix Coordinated Conservation meeting 5/21, and the Implementation Subcommittee meeting 5/29, reviewing the agendas and minutes of the Highway 64 Communities Stormwater and Wastewater Collaborative meetings, filing a request for speakers from MNDOT Stillwater Crossing Team for the Basin Team's 6/26 meeting, reviewing the NPDES public notices for both states, editing the Basin Team email list, and other communications with Basin Team members through emails and phone calls.

Status of Agreement: The WDNR and the Science Museum of Minnesota have a signed agreement covering the Coordinator's funding. The Science Museum serves as the fiscal agent and reimburses the Coordinator on a monthly basis as invoiced. The WDNR has reimbursed the Science Museum for one-half of the annual cost of the program.

Lake St. Croix continuous water quality monitoring

Purpose and Scope

Previous nutrient-loading models for Lake St Croix assumed that oxygen-rich environments were present throughout the lake. Recent monitoring has revealed periods of no oxygen (anoxia) in deep areas of Bayport, Troy Beach, Black Bass, and Kinnickinnic pools (Fig. 1). In 2012, these anoxic conditions produced significant nutrient releases from sediments in the lower three pools. A dynamic water-quality model that incorporates this internal nutrient loading and simulates algal responses is being developed. The proposed continuous monitoring of dissolved oxygen, temperature, and algal abundance in surface and deep waters in the two lower pools would provide data necessary for model validation.

Progress to Date

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Status is as follows:

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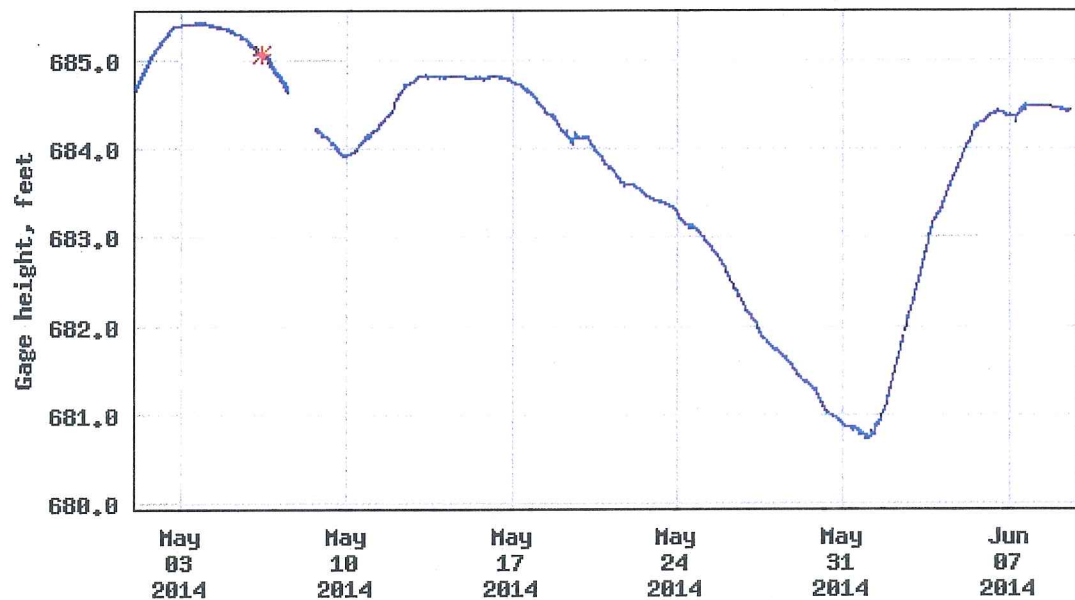
Summary June 10, 2014

Water quality sondes have been prepared for deployment. Site selection and approval will be completed in June. Plans are being made to deploy the water quality sondes in pools three and four once base-flow gauge height reaches 681 feet above sea level. Sondes will be in the river through October 2014 collecting observations every 15 minutes.

Currently, bi-weekly water quality profile data are being collected through a cooperative effort of the National Park Service, United State Geologic Survey, and the Metropolitan Council



USGS 05341550 ST. CROIX RIVER AT STILLWATER, MN



----- Provisional Data Subject to Revision -----

— Gage height

* Measured gage height

The State of the Lake report (assessing Lake St. Croix)

Purpose and Scope

The “State of the Lake Report—Assessing Lake St. Croix” will entail a comprehensive analysis of the ecological status and trends of the lake since 1999. This effort will build upon an existing database that integrates water quality data from several monitoring agencies, while extending seasonal trend analyses of physical, chemical, and biological variables to several tributary and lake sites. With the guidance of the Basin Team’s Monitoring and Assessment Committee, the State of the Lake Report will develop and standardize an assessment protocol that will serve as a template for a State of the Basin report.

Progress to Date

Summary March 18, 2014

The first task of this project will be the recalculation of historical flow estimates for the inflow and outflow of Lake St. Croix. Installation of USGS gages on the St. Croix River at Stillwater, MN (river mile 23.3) in 2011 and at Prescott, WI (river mile 0.3) in 2007 have enabled improved estimates of the relationship between those sites and the USGS gage site at St. Croix Falls, WI (river mile 52.0). Initial analysis, published in Magdalene et al. (2013), indicated 6% improved estimation overall, from 92% to 98% accuracy, and the need for an adjustment to the baseflow vs. stormflow relationship observed at St. Croix Falls. These efforts are expected to take six months, and will culminate in a 2014 USGS Scientific Investigation Report.

The WDNR contract was received January 31, 2013 at the St. Croix Watershed Research Station, and has since been routed through the Science Museum of Minnesota administrative offices. The invoice for the first year’s work will be billed as soon as possible, to enable Magdalene to begin work.

Summary June 10, 2014

The recalculation of historical flow estimates was completed and the Scientific Investigation Report has undergone internal review at the United States Geologic Survey. Historical flow estimates at Stillwater improved by 6% overall from 92 – 98% accuracy. In comparison, analysis of historical flow estimates at Prescott improved by 17% overall from 77% to 94% accuracy. Reviewer’s comments are being addressed and the document is nearing publication. Further analysis of the long-term discharge record have indicated alternating wet and dry cycles averaging 11.8 years over the last century that can be used to predict decadal patterns in low flow and high flow conditions for the near future. Although we have been experiencing high flow conditions in recent years, low flow conditions, accompanied by frequent algal blooms, are expected in the years leading up to the 2020 Total Maximum

Daily Load goal. Work has begun on Task 2 of this project, an assessment of water quality data and how the changes in historical flow estimates may influence understanding of long-term water quality loads within Lake St. Croix.

Watershed modeling of phosphorus reductions from agricultural best management practices

Purpose and Scope

We will apply the Soil and Water Assessment Tool (SWAT) model of the St. Croix basin to target implementation of agricultural best management practices (BMPs) to help compensate for increased nutrient loads to Lake St. Croix from bridge-related development. These BMPs include, but are not restricted to, no-till cropping of corn and soybeans, vegetated filter strips, grassed waterways, and reduced soil-test phosphorus. Changes in phosphorus load from each model subbasin will be mapped to allow spatial targeting of implementation. Nonpoint sources are the largest contributors of phosphorus to Lake St. Croix, and reductions from agriculture will be necessary to achieve the existing Total Maximum Daily Load (TMDL) goals, especially in light complications due to bridge-related development.

Progress to Date

Summary March 18, 2014

With funding from the National Park Service, a SWAT model of the St. Croix was initially built with SWAT2009, which has been superseded by SWAT2012. Hence the initial model has been re-built and re-calibrated in SWAT2012. Model construction and calibration has been a joint effort between the St. Croix Watershed Research Station and Texas A&M University, one of the principal architects of the SWAT model framework.

The workplan for this project has been submitted to the Wisconsin Department of Natural Resources (WDNR) for review. Project initiation is awaiting contract execution and release of funding by the WDNR.

Summary June 10, 2014

To gather client input, an overview of the project was presented to the St. Croix Basin Water Resources Planning Team ("Basin Team") on 27 March at the St. Croix River Association office in St. Croix Falls, WI. A second meeting was held on 13 May at the WDNR office in Baldwin, WI, to present the project to personnel from Wisconsin counties and the WDNR. These meetings focused on the agricultural best-management practices (BMPs) to be simulated in SWAT. These BMPs include no-till cropping of row crops, filter strips along field edges, grassed waterways within fields, post-harvest cover crops, improved soil health, and reduction of soil-test phosphorus. The project workplan was adjusted to reflect the selection of these BMPs and to arrange for systematic project updates to WDNR personnel. The revised workplan is currently being reviewed by WDNR.

LiDAR mapping St. Croix county

Purpose and Scope

St. Croix county has some of the most significant nutrient loading watersheds in the St. Croix Basin. LiDAR (Light Detection and Ranging) elevation data will increase the accuracy of watershed modeling results and improve phosphorous reduction strategies. LiDAR data would be a vital component and would serve as the basis for: stormwater planning, bluff land mitigation and restoration, surface modeling, land development, view shed analysis, and transportation mapping. LiDAR mapping would be made available to Federal, State and local agencies. LiDAR data would allow resource management agencies to efficiently plan, accurately model, and respond more quickly to resource management issues.

Progress to Date

Summary March 18, 2014

St. Croix County is complete with all the preliminary logistics of the LiDAR project. The money has been secured, the vendor has been chosen and the contracts signed. At this point we are waiting for spring to arrive and the conditions favorable for the flight to take place. The data collection will be leaf off conditions. Once the flight and photography is complete, we expect deliverables to St. Croix County by fall 2014.

Summary June 10, 2014

June 10 update: We are moving forward. The contractor/vendor was chosen. The spring (leaf off) aerial photography and Lidar data collection has been completed. (Flight was completed about a week ago) Hoping to have the final product in hand sometime this fall.